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Why could electron spin resonance be observed in a heavy fermion Kondo lattice?

Kochelaev B., Belov S., Skvortsova A., Kutuzov A., Sichelschmidt J., Wykhoff J., Geibel C., Steglich F.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We develop a theoretical basis for understanding the spin relaxation processes in Kondo lattice systems with heavy fermions as experimentally observed by electron spin resonance (ESR). The Kondo effect leads to a common energy scale that regulates a logarithmic divergence of different spin kinetic coefficients and supports a collective spin motion of the Kondo ions with conduction electrons. We find that the relaxation rate of a collective spin mode is greatly reduced due to a mutual cancellation of all the divergent contributions even in the case of the strongly anisotropic Kondo interaction. The contribution to the ESR linewidth caused by the local magnetic field distribution is subject to motional narrowing supported by ferromagnetic correlations. The developed theoretical model successfully explains the ESR data of YbRh 2Si 2 in terms of their dependence on temperature and magnetic field.

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